

the oldest living pupil of Cauchy. It sums up the work done by the Professor during the last twenty years. Several short notices, notes and new publications complete the number.

(2) The number opens with the President's (Prof. R. S. Woodward) address, delivered before the Society at its sixth annual meeting, December 28, 1899. It is entitled "The Century's Progress in Applied Mathematics." We learn from the "Notes" that the address has been printed in a separate pamphlet (25 cents each).—The status of imaginaries in pure geometry, by Prof. Charlotte Scott, is a paper which was communicated at the October meeting. Her text is the works of Von Staudt and Reye. She remarks that "it is one of the axioms of modern mathematics that Von Staudt placed the doctrine of imaginaries on a firm geometrical basis; but logical and convincing as his treatment is, when patiently studied in all its detail, it yet seems to me hardly practicable as a class-room method"; and then she proceeds concisely to examine the writings of the two above-named mathematicians, so far as they treat of imaginaries in pure geometry. The usual matter follows.

*Bollettino della Società Sismologica Italiana*, vol. v. 1899-1900, Nos. 4, 5.—On the present state of Vesuvius (July 3, 1899) and on the endogenous rising of the new lavic cupola during the months of February and March, 1898, by R. V. Matteucci.—The central explosion of Etna on July 19, 1899, by S. Arcidiacono.—On the activity of the volcanoes Vesuvius, Etna, Vulcano, Stromboli and Santorin in the autumn of 1898, by R. V. Matteucci.—The crater of Etna after the explosions of July 19 and 25, 1899, by A. Mascari. The effects of the explosions on the terminal cone and the internal condition of the crater are described.—New type of seismoscopic clock, by G. Agamennone.—Summary of the seismography of the earthquake of November 16, 1894, in Calabria and Sicily, by A. Riccio. A reprint of a memoir already noticed in NATURE.—Notices of earthquakes recorded in Italy (April 23-July 21, 1898), by G. Agamennone and A. Cancani, the most important being the earthquakes of Tripolitza (Greece) on June 2-3, Rieti on June 28, and Dalmatia on July 2, and earthquakes of distant origin on April 29, May 8 and June 22 and 29.

## SOCIETIES AND ACADEMIES.

### LONDON.

**Royal Society**, January 18.—"Further Observations on 'Nitragin' and on the Nature and Functions of the Nodules of Leguminous Plants." By Maria Dawson, B.Sc. (Lond. and Wales), 1851 Exhibition Science Research Scholar. Communicated by Prof. H. Marshall Ward, F.R.S.

In the continuation of the author's work (see *Phil. Trans.* vol. 192, p. 1, 1899) in the Cambridge Botanical Laboratory, cases have been observed—e.g. *Phaseolus*, *Desmodium*, *Acacia*—in which the filaments containing the organism disappear from the nodules at a very early age; no sharp distinction can be drawn between these and the nodules of *Pisum*, *Lupinus*, &c., where the filaments abound in much older nodules, but the suggestion arises that the mode of growth depends on special adaptations of the organism to the conditions in the cells of the nodules in each host. A marked crystal-layer occurs in the nodules of some genera; in others—e.g. *Desmodium*, *Robinia*—peculiar apple-green, nucleus-like cell contents are found. The organisms are unusually large in *Desmodium*, *Coronilla*, *Psoralea*, and some others; and single rods, isolated from pure cultures, of those from *Desmodium* were observed continuously under high powers in hanging drops, and their growth traced. The X and Y-shaped bacteroids arise by distinctly lateral branching of the straight rods. After twelve to fourteen days these break up into shorter rodlets. Pure cultures were made on various media, and the organism was successfully grown on silica jelly with nutrient salts. In seven days, at 17°C., colonies of the *Desmodium* organism were as much as 30  $\mu$  in diameter. The author is employing this method for testing the power of the organism to fix nitrogen.

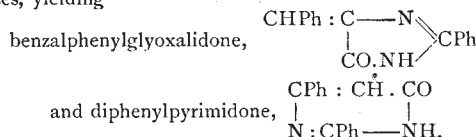
Comparisons of "nitragin" with pure cultures from *Pisum* and *Desmodium* show that all grow readily on gelatine or agar with additions of extract of pea-stems, asparagin and sugar; less readily on potato. Milk is not peptonised. A thick zoogloea forms on a decoction of peas. The organism is aerobic, does not ferment sugars, and may pass through a short motile stage. Other bacteriological characters are also examined, including the influence of temperature on infection of the root-hairs of the pea.

The author's experiments with reciprocal infections of organisms from one genus of Leguminosae to another, point to there being but one species concerned, but this is probably split up into several culture-races, specialised to the various agricultural and other plants concerned, as in the case of the rust-fungi, yeasts, &c.

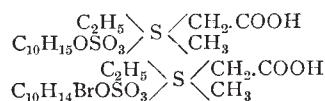
Crop-cultures of peas infected with the organism, in sterilised soil, ordinary soil, sand, sub-soils, &c., gave contradictory results. In a few cases a small increase was got by the use of the organism alone; but in other cases where nitrates were used instead the crop was larger. When nitrates as well as "nitragin" are added the crop may be even reduced.

The conclusion derived from the various experiments, however, is that the presence or absence of "nitragin" is but one factor in a complex problem, and that at the same time must be taken into account the complicated physical and biological conditions of the soil and atmospheric environments, as well as the symbiotic action of the host plants, in the removal of the products of metabolism from the field of action of the nodule organisms.

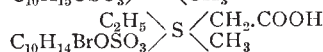
**Chemical Society**, February 1.—Prof. Thorpe, President, in the chair.—The following papers were read.—The chlorine derivatives of pyridine. Part v. Constitution of citrazinic acid. Formation of *aa'*-dichloropyridine and of *aa'*-diiodoisonicotinic acid, by W. J. Sell and F. W. Dootson.—The formation of heterocyclic compounds, by S. Ruhemann and H. E. Stapleton. Benzimidine and ethyl phenylpropionate react with formation of an intermediate product,  $\text{NH} \begin{smallmatrix} \text{CO.C: CPh} \\ \text{CPh: NH} \end{smallmatrix}$ , which then condenses, yielding



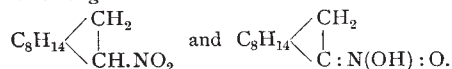
Urea, thiourea and guanidine condense with ethyl phenylpropionate yielding substituted hydantoin. The space configuration of quadrivalent sulphur derivatives. Methylenehydantoin dextrocamphorsulphonate and dextro- $\alpha$ -bromocamphorsulphonate, by W. J. Pope and S. J. Peachey. The authors have prepared thetine salts of the constitutions



and



containing optically active acid radicals, and show that the basic thetine radical is not optically active. They conclude that in a thetine the sulphur atom and the four atoms directly attached to it lie in one plane.—Nitrocamphane, by M. O. Forster. The author has prepared nitrocamphane and pseudonitrocamphane, to which he assigns the constitutions



Nitrocamphane is prepared by reducing bromonitrocamphane, and yields pseudonitrocamphane when its potash solution is acidified.—The absorption spectra of ammonia, &c., by W. N. Hartley and J. J. Dobbie.—Isoamarine, by F. R. Japp and J. Moir. The isoamarine of Feist and Arnstein obtained by heating *s*-dibenzoyl-*r*-diphenylethylenediamine in hydrogen chloride gas is identical with Snape and Brooke's isoamarine.—On the condensation of formaldehyde with ethyl malonate and on the synthesis of pentamethylenetricarboxylic acid, by J. F. Bottomley and W. H. Perkin, junr. In addition to the substances previously described as resulting from the condensation of formaldehyde with ethyl malonate, it is shown that ethyl pentanhexacarboxylate,



may also be formed. It is hydrolysed by baryta, yielding propanetetracarboxylic acid,  $(\text{CO}_2\text{H})_2\text{CH.CH}_2.\text{CH}(\text{CO}_2\text{H})_2$ , and by hydrochloric acid with formation of the corresponding acid, which on heating to 200° gives pentanetricarboxylic acid,  $\text{CO}_2\text{H.CH}_2.\text{CH}_2.\text{CH}(\text{CO}_2\text{H}).\text{CH}_2.\text{CH}_2.\text{CO}_2\text{H}$ .—The volumetric estimation of potassium, by R. H. Adie and T. B. Wood. The authors precipitate potassium as its cobaltinitrite,



and titrate the nitrite with permanganate in acid solution.—On the action of aluminium chloride on camphoric anhydride, iii., by F. H. Lees and W. H. Perkin, junr.

**Linnean Society**, February 1.—Dr. A. Günther, F.R.S., President, in the chair.—The President announced that on the occasion of the forthcoming International Exhibition in Paris, an International Congress of Botany will be held there from October 1–10, both dates inclusive.—Mr. George Massee exhibited lantern-slides in illustration of his paper on the origin of the Basidiomycetes, the substance of which had been communicated at the last meeting, and recapitulated the conclusions at which he had arrived.—Mr. Cecil R. P. Andrews exhibited two non-British grasses which he had found last year in the Channel Islands—*Phalaris minor*, Retz., from sandy shores and fields in Guernsey and Alderney, and *Milium scabrum*, Merl., from the cliffs of Guernsey.—Mr. J. E. Harting exhibited a specimen in the flesh of the Rufous Tinamu (*Rhynchotus rufescens*) which had been shot near Petersfield, Hants, on January 29, and gave some account of the experiments which had been made to acclimatise this South American gamebird since its first introduction by Mr. John Bateman at Brightlingsea, Essex. No difficulty had been experienced in regard to climate or food, but inasmuch as these birds do not perch in trees like pheasants, but roost on the ground, they are more liable to destruction by foxes, a circumstance which has materially affected their increase.—A report was read on the zoological results of an expedition to Mt. Roraima in British Guiana, undertaken by Messrs. F. V. McConnell and J. J. Quelch in 1898; communicated to the Society by Prof. Lankester, F.R.S., on behalf of the members of the British Museum staff who had prepared it. A previous journey, occupying sixty days, had been made by the same travellers in 1894, their route then being by the rivers Essequibo and Rupununi. The route selected in 1898, by the Mazaruni river, to the Falls of Macrobah, occupied forty days only, twenty of which were spent in boats. With the exception of the last twenty miles, the entire journey lay through thick forest. Mt. Roraima (8700 feet) was found to have a sloping base clothed with dense vegetation, surmounted by a rectangular mass fifty-four square miles in area with perpendicular walls 2000 feet in height. On the south-west, part of the wall has slipped, and lies diagonally across the face of the upper portion of the mountain. By following the ledge so formed, the summit can be reached without serious difficulty. Amongst the Mammalia collected, a new mouse, described by Mr. De Winton as *Rhipidomys Macconnelli* (resembling *R. microtis* from Columbia, but darker in colour and with larger ears) was found near the summit. Amongst birds a new *Zonotrichia*, allied to *Z. pileata*, which is found throughout the greater part of Central and South America, is described by Dr. Bowdler Sharpe. Mr. G. A. Boulenger furnishes descriptions of some new reptiles (*Neusticurus rudis* and *Prionodactylus leucostictus*) and Batrachians (*Oreophrynella Macconnelli*, *Hylodes marmorata*, and *Otophryne robusta*), the last named being assigned to a new genus. Amongst Crustacea, of which a number were collected in the Upper Mazaruni river at an altitude of 2500 feet, Dr. De Man detected a new species of *Palaemon*, which he has named after Mr. Quelch. The collection of Myriopoda was found to contain new species of *Odontopellis* and *Enyurus*, of which descriptions are given by Mr. Pocock, who had already described two new spiders (*Ann. M. N. H.* ser. 6, xvi. p. 140) collected on this expedition. Two scorpions (*Broteochactus granosus* and *B. porosus*) are likewise characterised as new. A new Hemipteron (*Acrocoris perarmata*) and a new beetle (*Exagontus denticollis*) are described respectively by Mr. Kirby and Mr. C. O. Waterhouse, the latter insect being referred to a new genus.

**Zoological Society**, February 6.—Mr. Howard Saunders, Vice-President, in the chair.—The Secretary called attention to the breeding of a pair of black-headed buntings (*Emberiza melanocephala*) in the western aviary, about the middle of the month.—Mr. Oldfield Thomas exhibited and made remarks on some mounted heads of antelopes obtained on the Upper Nile by Captain H. G. Majendie. Amongst these were specimens of *Cobus maria*, *C. leucotis*, *Damaliscus tiang*, and *Gazella rufifrons*.—Mr. G. E. H. Barrett-Hamilton exhibited skins of the continental and British dormice, which he characterised as distinct, and proposed the subspecific name of *anglica* for the British form.—Mr. Barrett-Hamilton also exhibited skins of the variable hare (*Lepus timidus*, Linn.) from Scotland and Ireland,

to show their subspecific characters; and gave a short synopsis of palaearctic variable hares, describing as subspecifically new, under the name of *Lepus timidus ainu*, the representative form of the island of Yezo.—Mr. R. Trimen, F.R.S., communicated a paper by Lieut.-Colonel J. Malcolm Fawcett, entitled "Notes on the Transformations of some South-African Lepidoptera." This memoir was accompanied by a series of careful and characteristic coloured drawings from life of larvæ and pupæ collected by the author during a residence in Natal, chiefly at Ladysmith and Maritzburg. The early stages of seventeen Rhopalocera and thirty-one Heterocera were described and figured. Nearly all of these appeared to have been previously unpublished, and in the few instances where previous publication had occurred, the illustrations had been inexact or insufficient. In several species, not only the variations of the full-grown larvæ, but the changes exhibited at successive moults were well shown, especially in the Natalian species of *Papilio*. Among the Heterocera was specially noticeable the striking series of Saturniid larvæ, and still more the huge and extraordinary caterpillar of *Lophostethus dumolinii*, one of the largest of the Smerinthine hawk-moths, which, in addition to the usual caudal horn, bears many strong branched spines distributed over nearly the whole of the body. Colonel Fawcett's descriptions and drawings were accompanied by notes of value on the distribution, food-plants, &c., of the species concerned. Mr. Trimen expressed his deep regret (which he felt the Fellows of the Society would share) that the talented writer of this memoir, who had rejoined his regiment in Natal, was among those officers who were known to have been severely wounded during the siege of Ladysmith.—Mr. L. A. Borradaile read a paper on a small collection of decapod crustaceans from freshwaters in North Borneo. The specimens were referred to four species, of which one was a prawn and three were crabs. Of the latter one was considered to be new, and was described under the name of *Potamon kadamaianum*.—Mr. Oldfield Thomas read a paper on the mammals obtained in South-western Arabia by Messrs. Percival and Dodson during the autumn of last year. Twenty-eight species were enumerated, and the collectors' field-notes upon them were given.—A communication was read from Dr. R. W. Shufeldt on the feigning of death in fishes, based principally on observations made on specimens of *Pseudopriacanthus altus* and *Epinephelus niveatus* in the Aquarium of the United States Fish Commission at Washington.—A communication was read from Dr. A. G. Butler containing a revision of the butterflies of the genus *Zizera* (Fam. *Lycanidae*) in the collection of the British Museum. According to the author's views the genus *Zizera*, so far as was at present known, comprised sixteen species. These were enumerated and their specific differences were pointed out.

**Entomological Society**, February 7.—Mr. G. H. Verrall, President, in the chair.—The President announced that he had appointed Dr. T. A. Chapman, Mr. W. L. Distant, and Mr. C. O. Waterhouse as Vice-Presidents.—Mr. O. E. Janson exhibited examples of *Achias longividentis*, Walk., a remarkable fly from New Guinea, in which the eyes are set at the end of very long stalk-like processes. The specimens showed great variation in the length of the eye-stalks, which in the most fully developed males considerably exceeded the length of the wings.—Mr. J. W. Tutt exhibited a series of specimens of *Epunda lutulenta*, including several remarkable variations.—Mr. Champion exhibited a large number of Coleoptera collected in Switzerland. He called attention to the great variation in colour of one or two common species of the Chrysomelid genus *Orina*, and said he believed that the forms known as *O. caecaliae*, Schrank, *O. speciosissima*, Scop., and under other names, all belonged to one extremely variable species.—Prof. T. Hudson Beare showed specimens of *Dinoderus minutus*, Fab., obtained from a bamboo-basket in his house at Richmond.—Mr. H. Donisthorpe exhibited a larva-case of *Clythra quadripunctata* taken from a nest of the red-wood ant—*Formica rufa*. He commented upon the unsatisfactory state of our knowledge as to the food-habits of the larvæ of *Clythra*, and said he believed the larvæ fed upon the eggs of the ant.—Mr. Gahan mentioned, in connection with the genus *Clythra*, that these beetles possess a stridulating organ on the meso-notum, not along the middle as in Longicorns and Megalopidae, but towards the lateral edges, and consisting of two widely separated striated areas over which the edge of the pronotum moves. The stridulating areas were present, he said, in nearly all the genera of Clythridæ, and might almost be regarded as a characteristic of the family. The fact that these



beetles stridulate was apparently known to Darwin, who, in the "Descent of Man," erroneously stated that the stridulating area was situated on the pygidium.

## DUBLIN.

**Royal Irish Academy, February 12.**—Dr. Benjamin Williamson, F.R.S., Vice-President, in the chair.—Prof. Charles J. Joly read a paper on the place of the *Ausdehnungslehre* in the general associative algebra of the Quaternion type. He pointed out that the cardinal distinction between quaternions and other systems of space analysis lies in the thoroughly associative and distributive character of the former. He showed that a Grassmann system applicable to a space of  $n$  dimensions is equivalent to a very restricted use of the associative algebra of  $n+1$  units obeying the laws  $i^2 = -1$ , and  $i_j i_i + i_i i_j = 0$ . In fact, a progressive product is simply the part of highest order in the units in a complete product in the associative algebra. Regressive products are formed by the simple artifice of dividing "products" of order  $n+1$  by the product of all the units, and then starting afresh. The point symbol may be considered to be introduced by the artifice of leaving the origin arbitrary exactly as Hamilton has done, but somewhere in the fourth dimension when dealing with Euclidian space.—Prof. Grenville A. J. Cole read a paper on metamorphic rocks in eastern Tyrone and southern Donegal. The gneissic axis north of Pomeroy is shown in this paper to be invaded by granite of the Slieve Gallion type, and the metamorphism of the central region thus occurred, in all probability, prior to the "Caledonian" earth-movements. The gneiss itself, however, rarely shows the effects of pressure, and its structures seem due to the invasion of basic schists by an aplitic granite at some early period. Direct comparison is made between its structures and those that are clearly due to the invasion of the Slieve Gallion granite into schists at Fir Mountain. The large area west of Pettigo in South Donegal similarly shows a foliated granite (the archæan gneiss), which owes most of its foliation to the inclusion and streaking out of masses of pre-existing amphibolite. Bands of micaceous rock are formed from the partial absorption and metamorphism of garnet-pyroxenites and garnet-amphibolites. The latter rocks may have been sedimentary, and are now found as great "eyes" and lentils, round which the pure white gneiss flows, and into which it sends off veins. The boundary between the Dalradian schists and the gneiss is sufficiently obscure in this area for it to be possible that the amphibolites were originally the lower members of the Dalradian series. At any rate, they represent a floor on which the Dalradians were laid down. The gneiss is in no sense the fundamental rock; it is, however, traversed by later granite veins, which belong probably to the Caledonian intrusions. As in some French districts, the metamorphic area of South Donegal shows the effects of igneous intrusion and contact-metamorphism on a regional scale, and dynamic metamorphism has played but a minor part in determining its structures.

## PARIS.

**Academy of Sciences, February 12.**—M. Maurice Lévy in the chair.—The President announced to the Academy the loss it had sustained by the death of M. Émile Blanchard, member of the Section of Anatomy and Zoology.—Researches in the uric acid series, by M. Berthelot. Determination of the heats of combustion and formation of methyl purine, hypoxanthine, 8-oxypurine, and 7-methylhypoxanthine.—On the dispersion of the radium rays in a magnetic field, by M. Henri Becquerel. A continuation of work previously published upon the same subject. The experiments were carried out in a uniform magnetic field, of intensity  $H$ , and the radius of curvature,  $\rho$ , of the path of the ray measured,  $H\rho$  being constant. The lower limit of  $H\rho$  was measured when screens of various substances (paper, aluminium, mica, glass, platinum, &c.) were interposed. Some of the phenomena observed are not capable of explanation by any simple hypothesis.—The synthesis of camphoric acid by means of camphoric acid, by MM. A. Haller and G. Blanc. The steps of the synthesis are as follows: camphor is oxidised to camphoric acid, and this reduced with sodium amalgam to campholide. This, by treatment with hydrobromic acid and subsequent reduction, yields camphoric acid.—M. Schwendener was elected a correspondent for the Section of Botany, in the place of the late Baron de Müller.—Rapid variations of radial velocity of the star  $\delta$ -Orion, by M. H. Deslandres. Eleven photographs of the spectrum of  $\delta$ -Orion is taken between December 8, 1899, and January 25, 1900, showed that this star possesses

periodic variations in its radial velocity, the period being about 1.92 days.—The dynamical laws of cyclones, by M. Admiral Fournier. The author deduces an expression correlating the barometric pressures at two points, and the corresponding distances from the centre of the cyclone, which will be of practical service in navigation.—On the tangent circles to four isotropic planes; and on surfaces of double circular generation, by M. Eugène Casserat.—On harmonic equations and isothermal surfaces, by M. A. Thybaut.—On anharmonic algebraic equations, by M. Autonne.—Plausible value of a variable magnitude, by M. Estienne.—On two problems in probability, by M. Andrade. A rectification of a note previously published.—On the method of Neumann and Dirichlet's problem, by M. W. Stekloff.—On the zeros of real integrals of linear equations of the third order, by M. Davidoglou.—On the constitution of white light, by M. E. Carvallo. A reply to the criticism of M. Gouy.—On some consequences of the prism formulæ, by M. A. de Gramont.—A new source of light for spectrometry of precision, by MM. Ch. Fabry and A. Perot. An arc is formed between two metallic poles, one of which is kept in rapid oscillation, the whole apparatus being *in vacuo*. The troubles incident to the production of a continuous arc in a vacuum are overcome by the device of keeping one pole in oscillation.—A comparison of various patterns of the Wehnelt contact-breaker, by M. Alfred Turpain. From the point of view of duration and economy, the form with holes suggested by Caldwell is preferable to the form with platinum wire. For usefulness and rapidity either pattern of Wehnelt interrupter is better than the Foucault contact-breaker.—On thermomagnetic currents, by M. G. Moreau. The author regards his experiments as proving that the Hall phenomenon is due to a deformation of the plate under the influence of the magnetic field.—Complete synthesis of the phorone of camphoric acid, by M. L. Bouveault. From adipic acid  $\alpha$ -methylcyclopentanone is prepared, and this, condensed with acetone, gives the phorone of camphoric acid.—On the composition of essence of sandal wood from the East Indies, by M. M. Guerbet. Two isomeric hydrocarbons were isolated, each of the composition  $C_{15}H_{24}$ , and distinguished as  $\alpha$ - and  $\beta$ -santalene. A mixture of alcohols  $C_{15}H_{24}O$ , an aldehyde, santalal, and two acids were also obtained, further investigations on which will be proceeded with.—Transformation of nitrobenzene into aniline by an organic reducing ferment, by MM. E. Abelous and E. Gérard. The ferment present in the kidney of the horse, which in previous papers has been shown to be capable of reducing nitrates to nitrites, is now found to reduce nitrobenzene to aniline.—Researches on the digestion of the reserves in seeds in the course of germination, and their assimilation by the young plant, by M. Mazé. Seeds containing oil are capable of transforming the group  $CH_2$  into an alcoholic group  $CH(OH)$  by taking up oxygen from the air.—New researches on the evolution of the monstrellids, by M. A. Malaquin.—On a form of optically negative anhydrous silica, by M. A. Lacroix. The mineral described consists of anhydrous silica containing a little opal, and is found in widely differing strata. Its density is about 2.5; it is biaxial and optically negative. It is clearly differentiated from quartzine, lutecite and chalcodony, and it is proposed to name it pseudo-chalcodonyte.—On some granitic rocks of Cape Marsa, by MM. L. Duparc and F. Pearce.—Examination of a meteorite which fell at Bierbélé, near Borgo, in Finland, on March 12, 1899, by M. Stanislas Meunier.—Specific heats of some organic substances, by M. G. Fleury. The specific heats of cellulose, wool and leather are given.

## AMSTERDAM.

**Royal Academy of Sciences, December 30, 1899.**—Prof. Stokvis in the chair.—Report by Prof. Martin and Prof. Behrens on the paper, presented by Dr. H. van Cappelle, entitled "New observations on the Dutch diluvium, especially with a view to mapping out this formation (II.)." The conclusion arrived at, viz. to insert this paper in the *Transactions* of the Academy, was approved of.—Prof. Kluyver made a communication, entitled "Borel's summation-formulæ for divergent series." In this paper the author discusses a slight modification of these formulæ, which were suggested by Mr. Borel in his "Mémoire sur les séries divergentes," (*Ann. de l'École norm.*, t. 16, p. 77, footnote).—Prof. Van der Waals presented a communication, by Mr. J. D. Van der Waals, jun., entitled "The entropy of radiation." The principle of entropy has had to be constantly extended. Originally, entropy was attributed to conditions of equilibrium only. In accordance with the

theorem that a system, which approaches a new condition of equilibrium by a non-convertible process and might do so in various ways, compatible with the given combinations, changes its conditions in such a way that the entropy constantly increases, it has become necessary to attribute entropy to conditions of non-equilibrium as well. If this theorem is to hold good generally, entropy has also to be attributed to radiation. In his H theorem Boltzmann has given a formula for the entropy in the case of material molecules that are not in a condition of maximum entropy and consequently not in equilibrium. The author is endeavouring to find a similar formula for radiation. He considers the action of an electrical force upon electrical vibrators as an analogue of the collisions of material molecules.—Prof. W. Kapteyn presented a supplement to the communication made at the meeting of November 25, 1899, entitled "On certain special cases of Monge's differential equation."—Prof. Winkler presented a paper, by Mr. P. H. Eykman, entitled "A new graphical system of craniology." Instead of the absolute measurements of the skull, Schmidt employs the relative ones, which he obtains by multiplying the absolute ones by  $\frac{300}{L+B+H}$ , by which their sum becomes constant = 300.

Geometrically, the triple system of ordinates is thereby changed into a double one, in the shape of an equilateral triangle. All three measures are equal in it, and this method is adapted for a rough survey of a large group of skulls. Alsatian skulls, published by Dr. Blind (537 in number), drawn in the system, serves as an example.—Prof. Bakhuys Roozeboom presented a paper, by Dr. Ernst Cohen, entitled "On the theory of the transition elements of the third kind (I.)."—Prof. Moll presented a paper, by Miss Tine Tammes, entitled "Pomum in pomu." Within a large apple, presented by Prof. C. A. J. A. Oudemans, there is another smaller apple, which is entirely disconnected from the surrounding one. The entire texture of the inner apple is filled up with a mycelium, while the fungus in the outer one is altogether lacking. The presence of the fungus in the interior of the original, normal apple is the cause of the monstrosity.—Prof. Franchimont presented two papers, by Dr. P. van Romburgh, of Buitenzorg, entitled (a) "On the nitration of dimethyl aniline in a solution of strong sulphuric acid"; (b) "On the formation of indigo from Indigoferas and from Marsdenia tinctoria."—Prof. Kamerlingh Onnes presented a paper, by Mr. E. van Everdingen, jun., on Hall's effect and the increase of magnetical resistance in bismuth at very low temperatures (I.) (continuation).—Prof. Van der Waals presented a paper, by Dr. P. Zeeman, entitled "Observations concerning an asymmetrical change in the spectral lines of iron radiating in a magnetic field." The observations were made at the request of Prof. Voigt, of Göttingen, who deduced from theory that in weak magnetic fields a triplet tends to become asymmetrical, having the more intense component on the less refrangible side, the component on the violet side being at the same time at a greater distance from the original line than the second outer component. Measurements made on negatives proved the existence of asymmetries, which in many cases were in accordance with theory. A few exceptions to theory were, however, noticed. All the above papers will be inserted in the Academy's *Proceedings*.

## DIARY OF SOCIETIES.

THURSDAY, FEBRUARY 22.

ROYAL SOCIETY, at 4.30.—Total Eclipse of the Sun, January 22, 1898. Observations at Viztiadug: Sir N. Lockyer, K.C.B., F.R.S., Captain Chisholm-Batten, R.N., and Prof. Pedler, F.R.S.—Preliminary Note on the Spectrum of the Corona, Part II.: Sir N. Lockyer, K.C.B., F.R.S.—On the Structure of Coccospheeres and the Origin of Coccoliths: Dr. H. H. Dixon.—The Ionisation of Dilute Solutions at the Freezing Point: W. C. D. Whetham.

ROYAL INSTITUTION, at 3.—Modern Astronomy: Prof. H. H. Turner, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—The Standardisation of Electrical Engineering Plant: R. Percy Sellen. (Adjourned Discussion.)

INSTITUTION OF MECHANICAL ENGINEERS, at 8.—Improvements in the Longworth Power-Hammer: Ernest Samuelson.—Portable Pneumatic Tools: Ewart C. Amos.

FRIDAY, FEBRUARY 23.

ROYAL INSTITUTION, at 9.—Recent Studies in Gravitation: Prof. J. H. Poynting, F.R.S.

PHYSICAL SOCIETY, at 5.—Prof. R. W. Wood will exhibit and describe his Photographs of Sound Waves and the Kinematographical Demonstration of the Evolutions of Reflected Wave-fronts: a New Seudo-scope: Diffraction Colour-Photographs; Artificial Parhelia.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Bearing Springs: B. Humphrey and H. E. O'Brien.

MONDAY, FEBRUARY 26.

INSTITUTE OF ACTUARIES, at 5.30.—Surrender Values and the Principles which underlie their Calculation: F. W. Fulford.

SOCIETY FOR THE PROTECTION OF BIRDS (Westminster Palace Hotel), at 3.—Annual Meeting.

TUESDAY, FEBRUARY 27.

ROYAL INSTITUTION, at 3.—Structure and Classification of Fishes: Prof. E. Ray Lankester, F.R.S.

SOCIETY OF ARTS (Foreign and Colonial Section), at 4.30.—Agricultural Education in Greater Britain: R. H. Wallace.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Corrosion of Marine Boilers: John Dewrance.

ROYAL PHOTOGRAPHIC SOCIETY, at 8.—Electricity in connection with Photographic Action: W. Friese-Greene.

WEDNESDAY, FEBRUARY 28.

SOCIETY OF ARTS, at 8.—Pneumatic Dispatch: Prof. Charles A. Carus-Wilson.

THURSDAY, MARCH 1.

ROYAL SOCIETY, at 4.30.—*Probable Papers*: An Experimental Inquiry into Scurvy: F. G. Jackson and Prof. Vaughan Harley.—The Velocity of the Ions produced in Gases by Röntgen Rays: Prof. J. Zeleny.—Mathematical Contributions to the Theory of Evolution. VIII. On the Correlation of Characters not Quantitatively Measurable: Prof. K. Pearson, F.R.S.

LINNEAN SOCIETY, at 8.—On Botanic Nomenclature: C. B. Clarke, F.R.S.—On some Foraminifera of Tithonian Age from the Limestone of Nesseldorf: F. Chapman.

CHEMICAL SOCIETY, at 8.—Pilocarpine and the Alkaloids of Jaborandi Leaves: Dr. H. A. D. Jowett.—Isomeric Partially Racemic Salts containing Pentavalent Nitrogen, Parts I.—VII.: Prof. F. S. Kipping, F.R.S.—New Synthesis of Indene: Prof. F. S. Kipping, F.R.S., and Harold Hall.—(1) Potassium Nitrito-hydroximidisulphates and the Non-existence of Dihydroxylamine Derivatives: (2) Identification and Constitution of Fremy's "Sulphazotised Salts of Potassium": Dr. E. Divers, F.R.S., and Dr. T. Haga.—Some Acids obtained from  $\alpha$ -Dibromocamphor: A. Lapworth and E. M. Chapman.

FRIDAY, MARCH 2.

ROYAL INSTITUTION, at 9.—Malaria and Mosquitoes: Major Ronald Ross.

PHYSICAL SOCIETY (University College), at 4.30.—The Relative Rates of Effusion of Argon, Helium, and some other Gases: Dr. F. G. Donnan.—On the Distillation of Liquid Air and the Composition of the Gaseous and Liquid Phases: E. C. C. Baly.—The Reversibility of Galvanic Cells: T. S. Moore.—On the Damping of Galvanometer Needles: M. Solomon.

SATURDAY, MARCH 3.

ROYAL INSTITUTION, at 3.—Polarised Light: Lord Rayleigh.

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